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(54) **FORWARD DEPLOYING SUTURING DEVICE AND METHODS OF USE**

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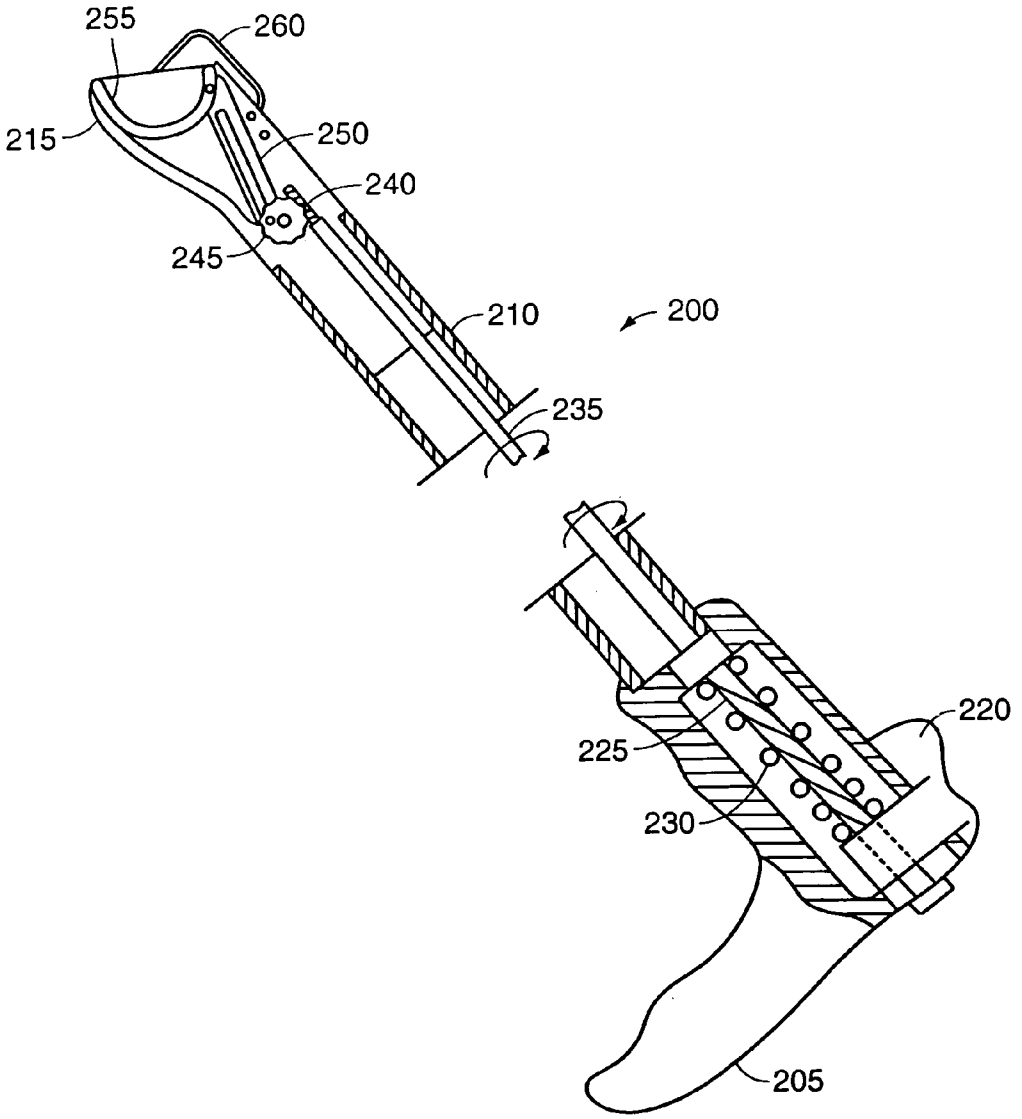
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(57) **ABSTRACT**

Sutures can be placed in difficult to access areas of the human body with devices, and related methods, utilizing a needle carrier. The devices and methods can be used in conjunction with both endosurgical and traditional open surgery procedures.



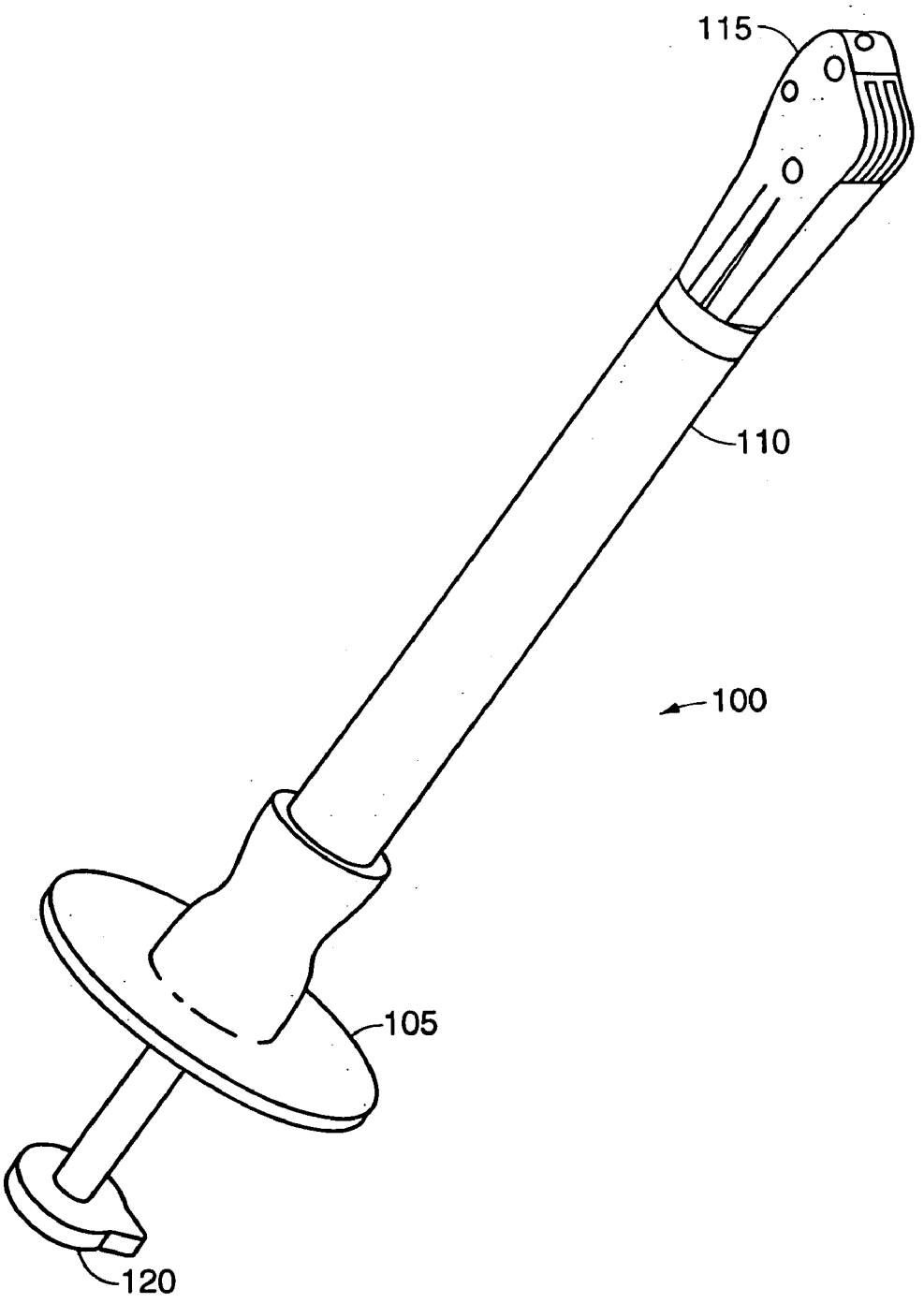


FIG. 1

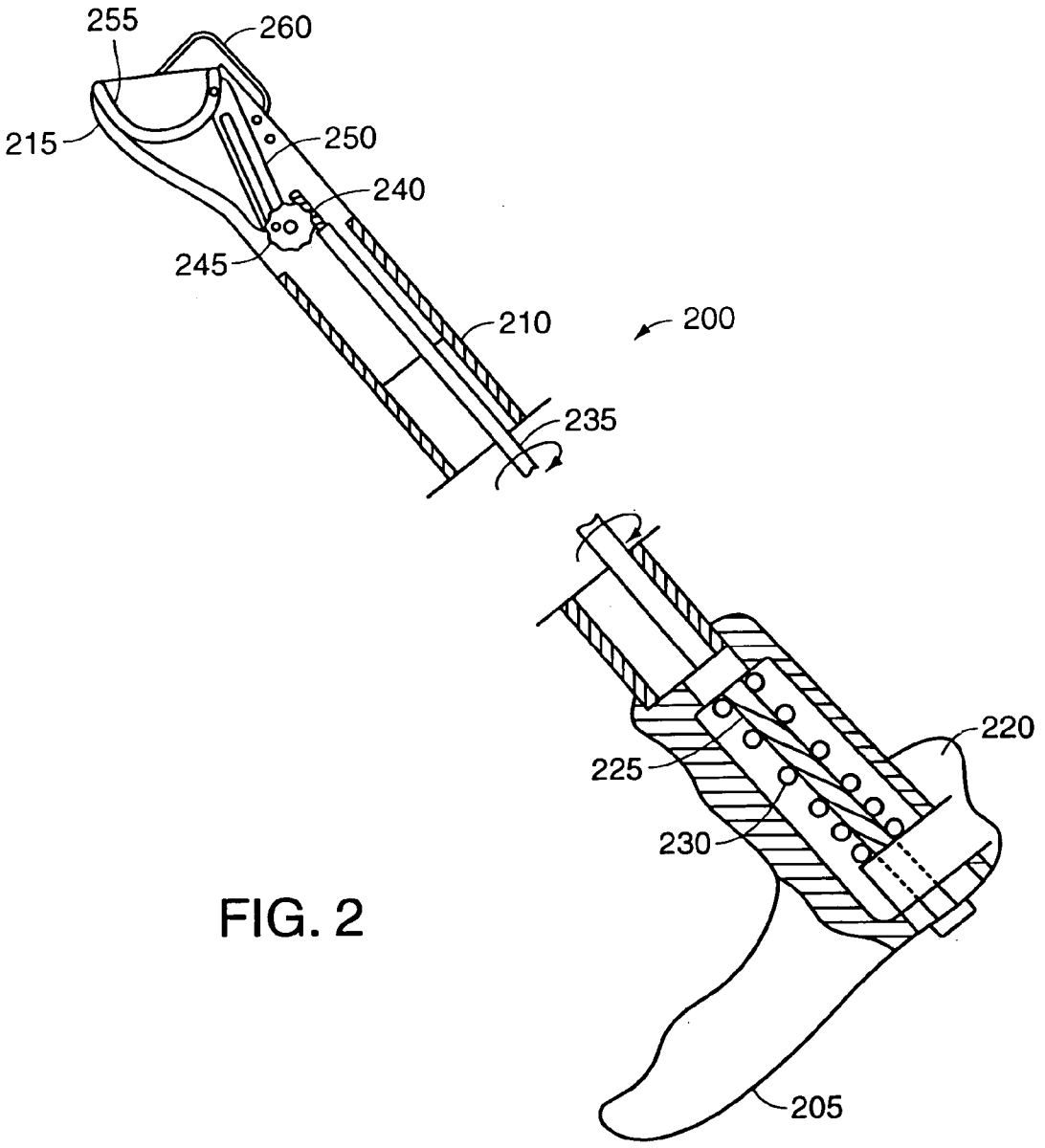


FIG. 2

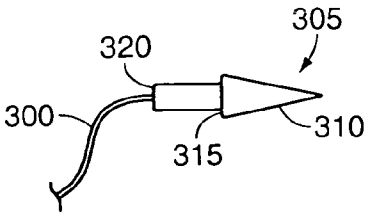


FIG. 3

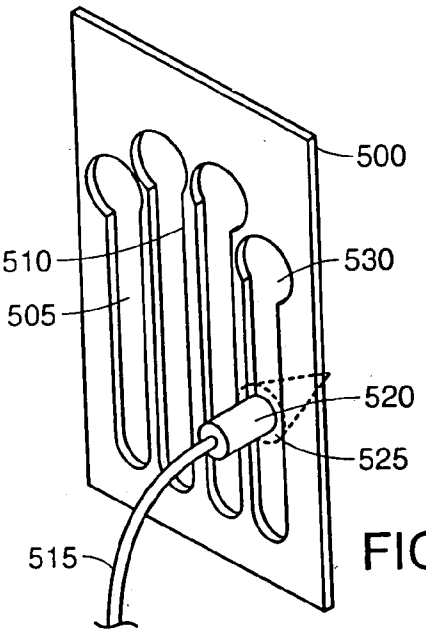


FIG. 5A

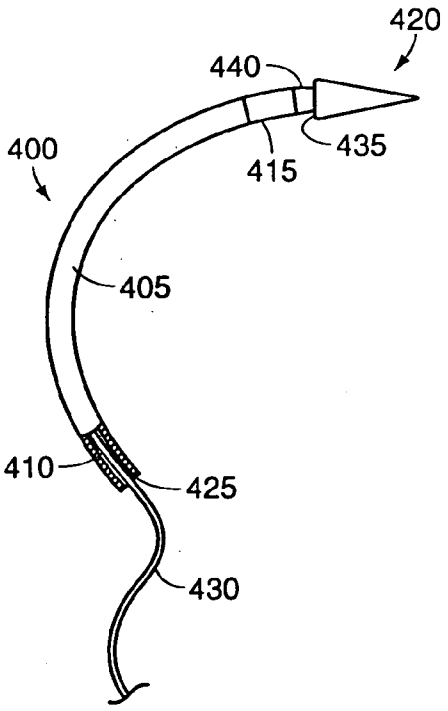


FIG. 4

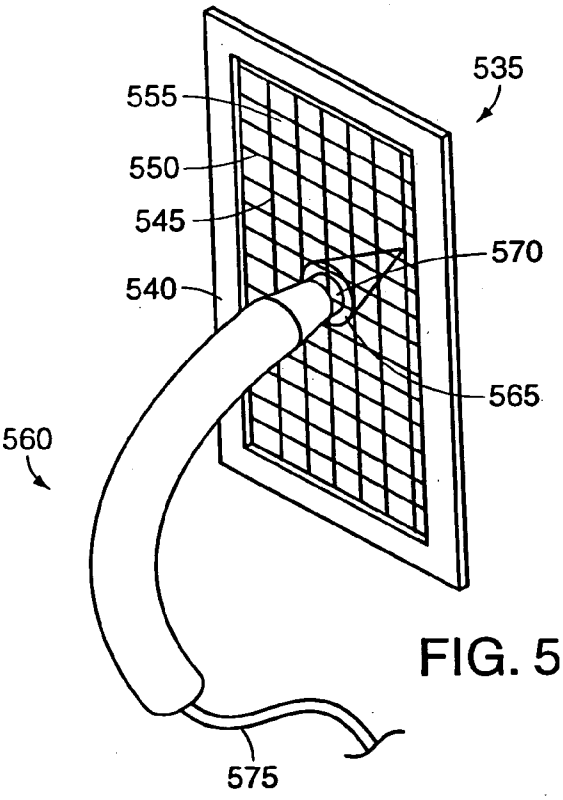


FIG. 5B

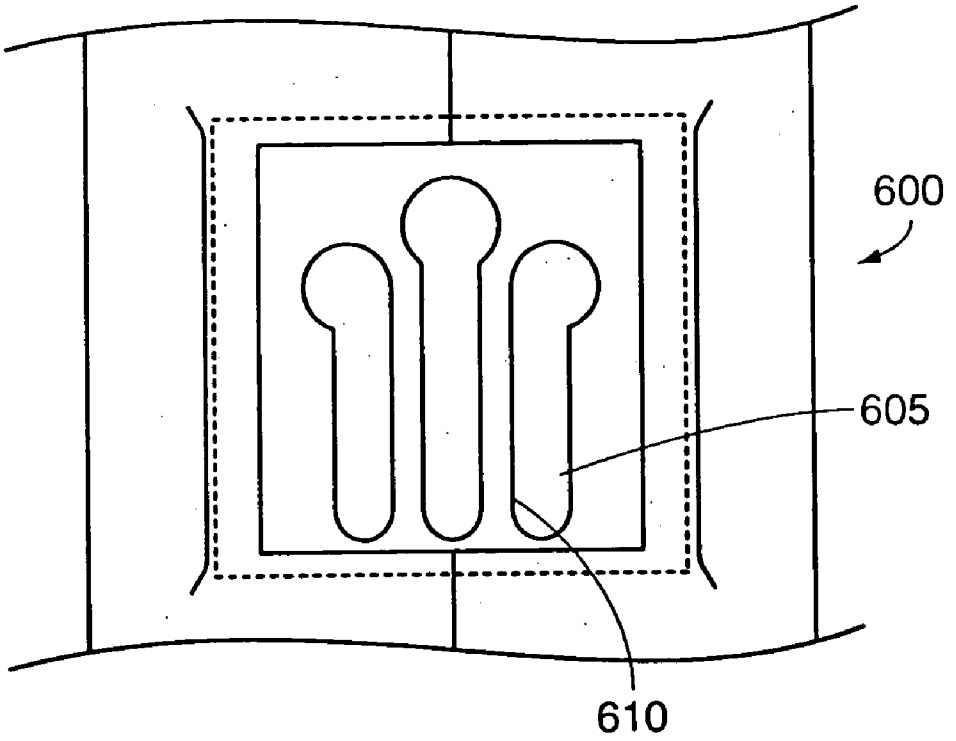


FIG. 6

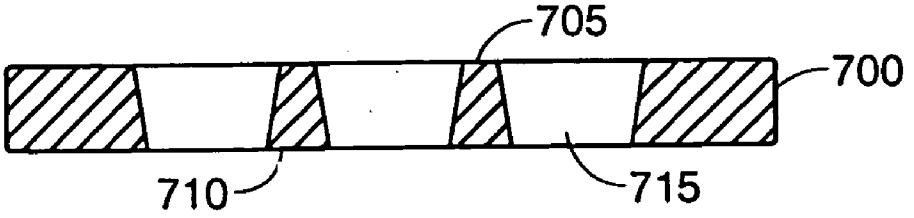


FIG. 7

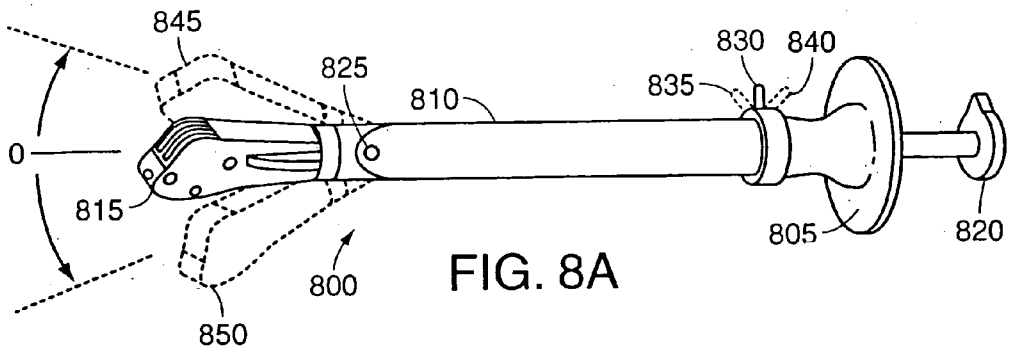


FIG. 8A

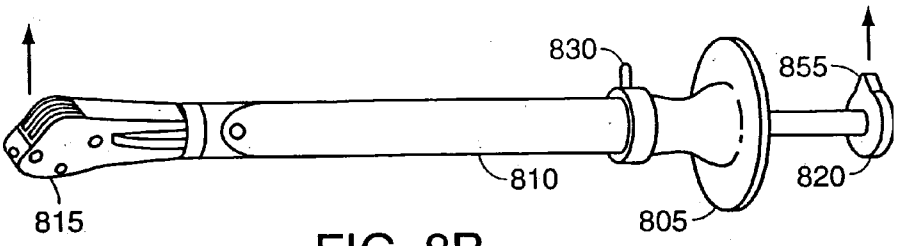


FIG. 8B

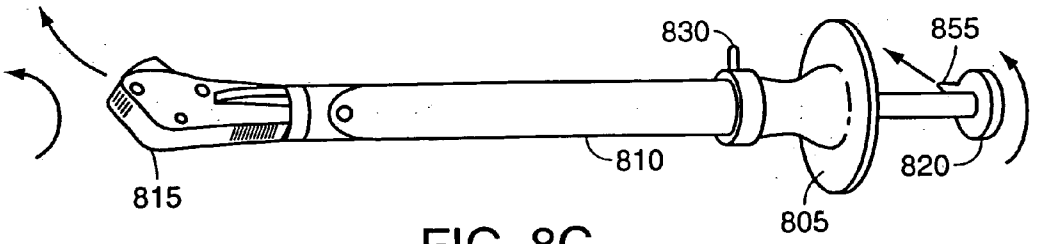


FIG. 8C

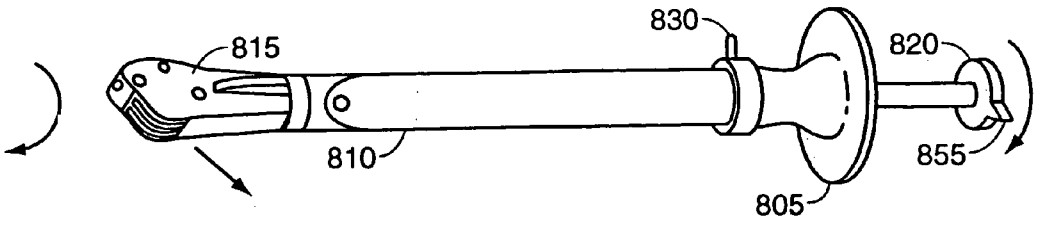


FIG. 8D

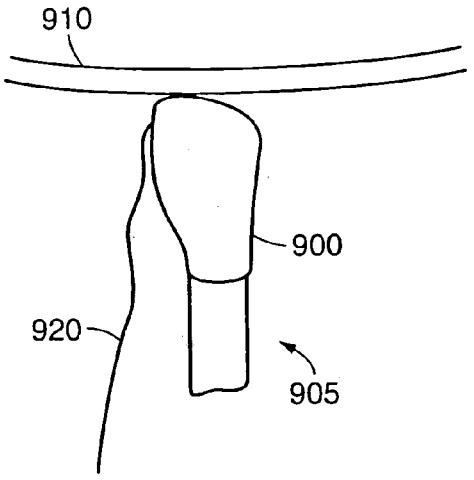


FIG. 9A

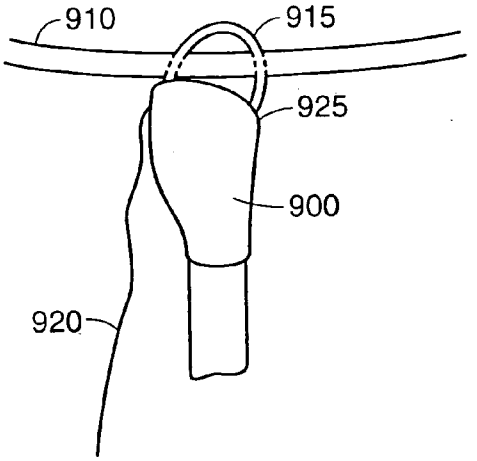


FIG. 9B

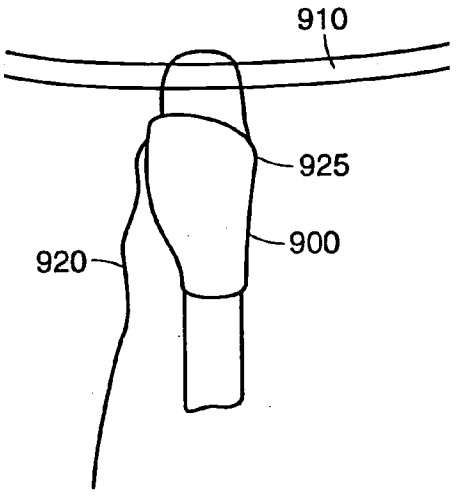


FIG. 9C

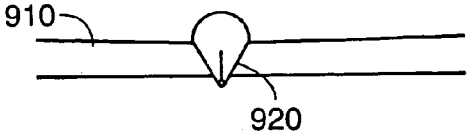


FIG. 9D

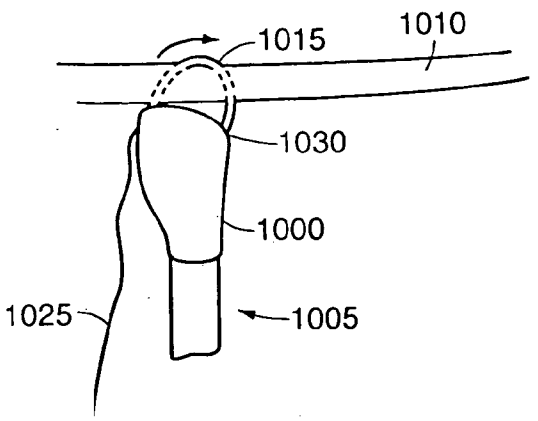


FIG. 10A

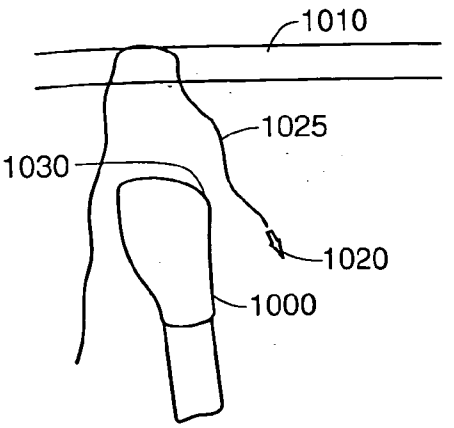


FIG. 10B

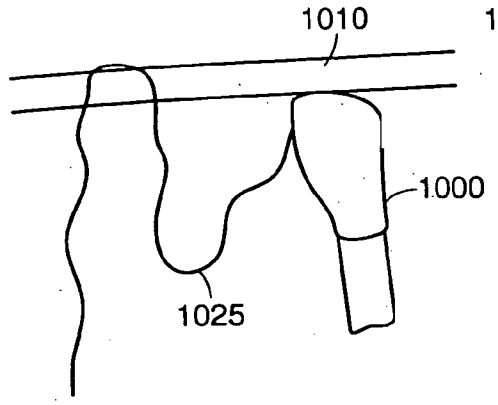


FIG. 10C

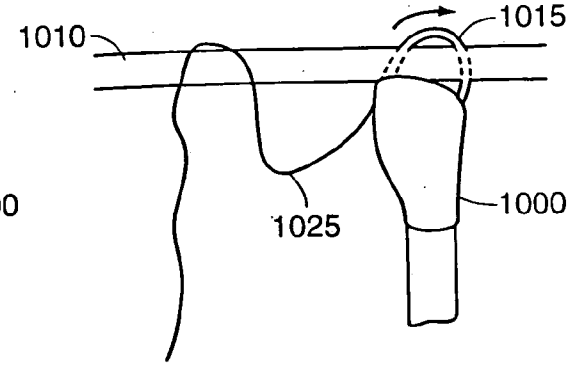


FIG. 10D

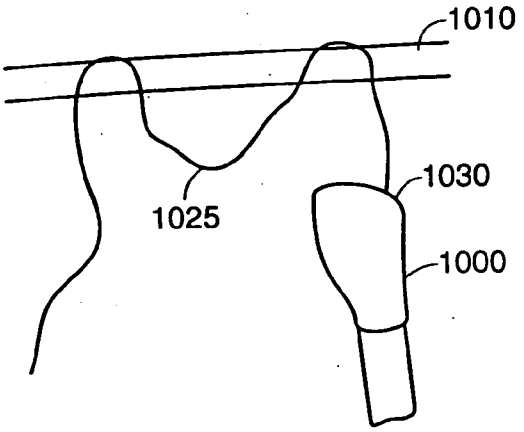


FIG. 10E

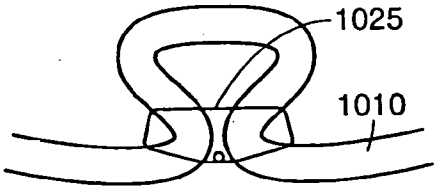


FIG. 10F

FORWARD DEPLOYING SUTURING DEVICE AND METHODS OF USE

TECHNICAL FIELD

[0001] The invention relates to devices and methods for placing sutures.

BACKGROUND OF THE INVENTION

[0002] Until recently, all but the simplest surgical procedures required the physician to make a large opening in the human body in order to expose the area requiring surgical repair. Today instruments are available that allow for viewing of internal body regions through a small puncture wound without exposing the entire body cavity. These instruments, called endoscopes, can be used in conjunction with specialized surgical instruments to detect, diagnose, and repair areas of the body that previously required open surgery to access.

[0003] Some surgical instruments used in endoscopic procedures are limited by the manner in which they access the areas of the human body in need of repair. In particular, the instruments may not be able to access tissue or organs located deep within the body or that are in some way obstructed. Also, many of the instruments are limited by the way they grasp tissue, apply a suture, or recapture the needle and suture. Furthermore, many of the instruments are complicated and expensive to use due to the numerous parts and/or subassemblies required to make them function properly. Suturing remains a delicate and time-consuming aspect of most surgeries, including those performed endoscopically.

SUMMARY OF THE INVENTION

[0004] The present invention allows for the performance of surgical procedures that involve the passing of sutures through tissue, for example, in a location that is facilitated by the suturing instrument deploying the suture in a forward-facing direction in relation to the suturing instrument. In addition, this invention provides for the catching and retrieval of the suture after it is passed through the tissue, for example. In particular this suturing instrument may be placed or positioned in the body such that a suture may be passed into a tissue of the body while the face of the distal end of the instrument abuts the tissue. Such a surgical device may allow for surgical procedures not previously possible or improve upon the performance of known surgical protocols.

[0005] In one aspect, the invention relates to a suturing instrument. The suturing instrument includes an elongate body member, a needle deployment system disposed at a distal portion of the elongate body member. The suture deployment system includes a forward-deploying needle carrier including a needle for tissue penetration and a catch to receive and retain the needle. The inclusion of a needle catch in the needle deployment system prevents the need for the introduction of a second surgical instrument into the location of the body where the suture was passed in order to retrieve the suture.

[0006] In some embodiments, the suturing instrument may include a deployment controller having a proximal end and a distal end. The deployment controller extends substantially along a longitudinal axis of the elongate body member to the distal portion of the elongate body member, where the distal end of the deployment controller is coupled to the needle carrier and moves the suture carrier between a retracted position and a deployed position. The proximal end of the deployment controller may be coupled to an actuator. In some embodiments, the deployment controller guides the suture carrier along a path which includes a proximal curved path segment such that the needle carrier initially travels away from the elongate body member and then toward the elongate body member.

[0007] Various embodiments according to the foregoing aspect of the invention can include the following features. A suture can include a needle, and the needle can be permanently fixed to an end of the suture. The needle fixed on the suture can insert into the needle carrier. Also, the needle can be plastic, metal, or polymer compound. In addition, the suturing instrument can include a catch to receive and retain the needle, where the catch is positioned on the body member such that a distal segment of the needle carrier's path is intercepted by the catch. Additionally, the suturing instrument may include a second needle carrier and a second forward-facing exit port. Further, the deployment controller may be coupled to the suture carrier with a flexible driver member. The flexible driver member may be manufactured of an alloy that includes at least or exclusively nickel and titanium.

[0008] In yet another embodiment, the invention relates to a suturing instrument including an elongate body member having a longitudinal axis and a distal tip needle deployment assembly joined with a distal end of the elongate body member such that the distal tip assembly is free to rotate axially about the longitudinal axis of the elongate body member. The distal tip suture deployment assembly includes a forward-facing needle exit port and a curved needle carrier channel formed in the distal tip needle deployment assembly, a curved needle carrier movably positioned in the curved needle carrier channel, a suture with an attached needle tip, and a deployment controller including a proximal end and a distal end. The deployment controller extends substantially along the longitudinal axis of the elongate body member to the distal end of the elongate body member, where the distal end of the deployment controller is coupled to the distal tip suture deployment assembly and moves the curved suture carrier through the curved suture carrier channel as the deployment controller moves between a retracted position and a deployed position. Additionally, the proximal end of the deployment controller may be coupled to an actuator.

[0009] In still another embodiment, the invention relates to a suturing instrument including a body member defining a forward-facing exit port and a carrier channel, a carrier movably positioned in the carrier channel, and a surgical needle attached with an interference fit on a distal end of the needle carrier. The needle carrier has a retracted position within an interior region of the body member and a deployed position exterior to the body member. The needle carrier is configured within the needle carrier channel such that the needle carrier exits the interior region of the body member through the forward-facing exit port. In addition, the forward-facing exit port, needle carrier channel, and needle carrier can be located in a distal tip assembly coupled to the body member, and the distal tip assembly can be coupled to the body member such that the distal tip assembly is free to

rotate axially about a longitudinal axis of the body member. In addition, the the needle carrier and needle catch can be located in a distal tip assembly coupled to the elongate body member at a pivot joint such that the distal tip assembly is free to deflect about the pivot joint. Such embodiments described above allow for enhanced control of the precise placement or position of the distal tip of the suturing instrument.

[0010] An additional aspect of the invention relates to a method for placing a suture in tissue. The method includes the steps of placing a suturing instrument enclosing a needle carrier having an attached needle for tissue penetration, deploying the needle carrier out of the suturing instrument through a forward-facing exit port such that the needle carrier exits an interior region of the suturing instrument through the exit port along a path which approaches being substantially tangential to an outer surface of the suturing instrument surrounding the forward-facing exit port, and capturing a needle attached to a suture and carried by the needle carrier in a catch that receives and retains the needle. The needle carrier is movably positioned within a needle carrier channel adjacent the tissue to be sutured.

[0011] In one embodiment, deploying the forward-deploying needle carrier out of the suturing instrument through a forward-directed exit port includes activating a deployment controller, which includes a distal end that extends substantially along a longitudinal axis of an elongate body member to the distal portion of the elongate body member. The distal end of the deployment controller is coupled to the needle carrier to facilitate movement of the needle carrier between a retracted position and a deployed position. In another embodiment, the invention further includes activating an actuator coupled to a proximal end of the deployment controller. In yet another embodiment, deploying the forward-deploying needle carrier out of the suturing instrument through a forward-directed exit port includes activating the deployment controller. The deployment controller is configured to guide the needle carrier along a path that includes a proximal curved path segment leading initially away from the elongate body member and then towards the elongate body member.

[0012] In yet another embodiment, the invention further includes placing a suturing instrument enclosing a second forward-deploying needle carrier. This embodiment may facilitate passing two sutures in the same general location without removing the surgical device from body in order to reload the needle carrier with a second needle. The needle carrier includes a needle and the second forward-deploying needle carrier is movably positioned within a needle carrier channel adjacent the tissue to be sutured. The needle may also include a suture attached to the needle. In another embodiment, the invention relates a method that includes the needle carrier following a path that includes a distal path segment. As the needle carrier traverses the distal path segment the needle is intercepted by the catch.

[0013] In another aspect, the invention relates to a method for shortening the pelvic floor including the steps of placing a suturing instrument enclosing a forward-deploying needle carrier including a needle adjacent to the tissue of the pelvic floor, deploying the suturing instrument such that the suture is passed through the tissue of the pelvic floor, and tightening the suture such that the pelvic floor buckles and is effectively shortened in height.

[0014] In one embodiment, the invention further comprises a second deploying of the suturing instrument such that the suture is passed through the tissue of the pelvic floor prior to tightening the suture such that the pelvic floor buckles and is effectively shortened in height.

[0015] In another embodiment, the invention relates to placing a suturing instrument enclosing a forward-deploying needle carrier including a needle adjacent to the tissue of the pelvic floor, in which the suturing instrument includes an elongate body member, a needle deployment system disposed at a distal portion of the elongate body member. The needle deployment system includes the forward-deploying needle carrier and a catch disposed on the elongate body member to receive and retain the needle. In yet another embodiment, the suturing instrument further includes a deployment controller that includes a distal end. The deployment controller extends substantially along a longitudinal axis of the elongate body member to the distal portion of the elongate body member, where the distal end of the deployment controller is coupled to the needle carrier to facilitate movement of the needle carrier between a retracted position and a deployed position.

[0016] These and other objects, along with advantages and features of the present invention herein disclosed, will become apparent through reference to the following description, the accompanying drawings, and the claims. Furthermore, it is to be understood that the features of the various embodiments described herein are not mutually exclusive and can exist in various combinations and permutations.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] In the drawings, like reference characters generally refer to the same parts throughout the different views. Also, the drawings are not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of the invention. In the following description, various embodiments of the present invention are described with reference to the following drawings.

[0018] **FIG. 1** is a perspective view of the general structure of one embodiment of the present invention.

[0019] **FIG. 2** is a partial-cutaway elevation of the general structure of another embodiment of the present invention.

[0020] **FIG. 3** is a side elevation view of a needle and suture.

[0021] **FIG. 4** is a partial-cutaway elevation of a needle with an attached suture in a needle carrier.

[0022] **FIGS. 5A and 5B** are perspective views of an alternate catch mechanism with a suture carrier.

[0023] **FIG. 6** is an end view illustrating the formed suture tip catch.

[0024] **FIG. 7** is a cross-sectional view of the suture tip catch shown in **FIG. 6**.

[0025] FIGS. **8**A-D are perspective views of the general structure of an embodiment of the present invention.

[0026] FIGS. **9**A-D illustrate a single suture-pass surgical method.

[0027] FIGS. **10**A-F illustrate a double suture-pass surgical method.

DETAILED DESCRIPTION

[0028] Embodiments of the present invention are described below. It is, however, expressly noted that the present invention is not limited to these embodiments, but rather the intention is that modifications that are apparent to the person skilled in the art are also included.

[0029] **FIG. 1** illustrates the general structure of one embodiment of the present invention. **FIG. 1** depicts a suturing instrument **100** including handle **105**, an elongate body **110**, a distal tip **115**, and an actuator button **120**. This embodiment of the present invention is particularly well suited to, for example, the fixation of sutures to the pelvic floor during a procedure to effectively shorten the pelvic floor for the treatment of hypermobility. As will become apparent, this embodiment includes features that prevent the need for positioning the target tissue between the needle exit port and the needle catch on the side of a distal tip while placing the suturing instrument in the body. The embodiment of **FIG. 1** allows for the positioning of the target tissue between the needle exit port and the needle catch on the front face of the distal tip during the placement of the suturing device into the body. The end of the distal tip **4** may be pressed against the target tissue in order to throw a suture into the tissue.

[0030] **FIG. 2** depicts an alternative embodiment of a suturing device **200**, which includes a handle **205**, an elongate body housing **210**, a distal tip **215**, and an actuator button **220**. The button **220** operates a drive screw **225** and compression spring **230**, which are housed in the proximal end of the body housing **210**. The button **220** is mechanically linked to the drive shaft **235**, which moves a gear drive **240**, which in turn drives a gear **245**. The gear **245** is coupled to a link drive pin **250**, which is itself coupled to a needle carrier **255**.

[0031] The needle carrier **17** shown in **FIG. 2** is circular; however, it is contemplated that the above embodiment may be modified to include needle carriers having non-circular contours (e.g., helical, elliptical, or straight). Although a single needle carrier **255** is shown in the figure, the above configuration may in fact contain more than one needle carrier. For example, multiple needle carriers may be actuated and driven independently by dividing the deployment controls and the needle carrier drivers into separate adjacent members with separate handles or controlled by a single handle.

[0032] Referring to **FIG. 3**, device **100**, **200** according to the present invention may incorporate a length of suture material **300** with a needle tip **305**. The needle tip **305** is held by a needle carrier **255**. The needle carrier **255** and needle tip **305** are deployable out of the housing **110**, **210** and into tissue. Deployment is via an actuator button **120**, **220** coupled to rigid driving members which are suitably attached to the needle carrier **255**. With renewed reference to **FIG. 2**, the actuator button **220** is pushed, simultaneously driving the needle carrier **255** and needle tip **305** into a catch mechanism **260**. The needle carrier **255** is retracted back into the housing **210** and the needle tip **305** remain in the catch mechanism **260**.

[0033] A needle tip **305** comprises a body **310** having a shoulder **315**. The shoulder **315** is the rear surface of the needle tip body **310** that engages a catch **260** in the manner of a flange. A length of suture material **300** is inserted into a hole **23** located on the body **310** and attached to the needle tip **305** thereby. The suturing material **300** is attached to the body **310** by any suitable means, such as crimping or adhesive bonding. It should be understood that the illustrated arrow-shaped body **310** is merely illustrative, and the shape may be varied to fit a particular application. The needle tip **305** can be manufactured from a plastic, metal, or polymer compound and can be formed by, for example, extrusion, molding, or machining. Furthermore, the nature of the suture **300** is immaterial to the present invention. The needle tip **305** of the present invention may be used with a suture of any type, length, diameter, and characteristics.

[0034] Referring now to **FIG. 4, a** needle carrier **400** comprises a body **405** defining a lumen **410**, a needle holder **415** to receive a needle tip **420** for tissue penetration. The lumen **410** is in communication with the needle holder **415** at one end and with an aperture **425** at the other end. The needle holder **415** is sized and shaped to releasably engage the needle tip **420**. A length of suture material **430** attached to the needle tip **420** is inserted into the needle holder **415**, through the lumen **410**, and out the aperture **425**. The attached needle tip **420** is then releasably engaged with the needle holder **415**. Alternatively, the needle carrier **400** can be a solid piece with the suture **430** disposed in a groove in the outer surface of the needle carrier **400**.

[0035] The needle tip **420** is releasably engaged with the needle holder **415** so that the shoulder **435** protrudes slightly from the needle carrier **400**. The rear surface of the shoulder **435** faces away from the sharpened tip of the needle tip **420**. The needle tip **420** and the needle holder **415** are engaged such that the needle tip body **440** is held in place by frictional forces when the needle carrier **400** is extended forward. The needle tip body **440** is released from the needle holder **415** when the needle carrier **400** is retracted from a catch. This is facilitated by dimensioning the shoulder **435** so as to be retained by the catch **260** when the needle carrier **400** exits the catch **260**. The interaction of the needle carrier **400** and various catches is described in greater detail with respect to **FIGS. 5A and 5B**.

[0036] **FIG. 5A and 5B** depict alternate catches and illustrate their operation. Referring to **FIG. 5**A, the catch **500** includes a series of openings **505** defined by successive ribs **510**. The catch **500** receives a needle carrier (not shown) and a suture **515** with a needle tip **520** through opening **505**, the ribs **510** deflecting slightly to allow the suture carrier and needle tip **520** to pass through. After the needle tip shoulder **525** has cleared the ribs **510** and the suture carrier has been withdrawn, thereby releasing the needle tip **520**, the ribs **510** spring back to their original position defining the openings **505**. The openings **505** are chosen to be smaller in dimension than the needle tip shoulder **525**. This causes the catch **500** to retain the needle tip **520** because, due to the flat rear surface of the tip shoulder **525**, needle tip **520** cannot pass back through an opening **505**. When it is necessary to remove the needle tip **520** from the catch **500**, it may be moved toward an enlarged portion **530** of opening **505**; enlarged portion **530** is sized to allow the needle tip shoulder **525** to pass through without resistance. The catch **500** is preferably constructed of thin stainless steel of high temper, such as ANSI 301 full hard. The catch **500** may be fabricated by means of stamping, laser machining, or chemical etching.

[0037] Referring now to **FIG. 5B, a** catch **535** includes a frame **540** to which is attached a woven mesh **545**. Threads **550** creating the woven mesh **545** may be nylon, polyester, or the like woven in a common over/under pattern. The weaving of the threads **550** creates windows **555** in the mesh through which a needle carrier **560** may be passed. The needle carrier **560** is constructed such that the shoulder **565** of the needle tip **570** is larger than the windows **555**, or conversely, threads **550** are woven such that the windows **555** are smaller than the needle tip shoulder **565**. The needle tip **570** of the needle carrier **560** pushes the threads **550** aside, allowing the needle tip shoulder **565** to pass through the holes **555**. Upon withdrawal of the needle carrier **560**, the threads **550** return to their original positions and the catch **535** retains the needle tip **570** and attached suture **575** (once again due to the flat rear surface of tip shoulder **565**, which is larger in size than the windows **555**).

[0038] Referring to **FIG. 6**, the catch **600** includes openings **605** defined by ribs **610**. The configuration and function of the formed tip catch **600** is similar to that described earlier with respect to **FIG. 5A**. When the catch **600** is fabricated by means of chemical etching, the preferred method is to etch from a single side, a technique known in the art as single sided etching. When the catch **700** is etched from a single side, the ribs **705** have a tapered cross section **710** as shown in **FIG. 7**. The tapered cross section **710** helps to guide the needle tip **520** of the needle carrier into the catch openings **715**, thereby minimizing the chance of the sharpened end of the needle tip **520** hitting the top of the ribs **705**.

[0039] FIGS. **8**A-D depict an alternative embodiment of a suturing device **800**, which includes a handle **805**, an elongate body housing **810**, a distal tip **815**, an actuator button **820**, a pivot joint **825**, and a distal tip deflection control lever **830**. In **FIG. 8**A, the control lever **830** is mechanically linked to the distal tip **815** by a cranking assembly that allows the movement of the control lever **830** from a forward position **835** to a back position **840** to cause the deflection of the distal tip **815** about a pivot joint **825** from a tip up positon **845** to a tip down position **850**.

[0040] Moreover, distal tip **815** may be rotatable about the axis of the elongate body housing **810** as shown in FIGS. **8**B-**8**D. For example, an actuator button **820** may be secured to the distal tip **815** through housing **815**. Rotation of the actuator button **820** causes a corresponding rotation of the distal tip **815**. The actuator button **820** may include a directional indicator **855** such as a pointed shape on the actuator button **820** that is aligned with the plane in which the needle tip (not shown) travels during deployment of the device **800**. **FIGS. 8C and D** depict the rotation of the distal tip **815** by 90 degrees in alternative directions from the starting position depicted in **FIG. 8B**. Additionally, the range of rotation of the distal tip **815** may include a complete 360 degrees about the axis of the elongate body housing **810**.

[0041] Current surgical methods of treating hypermobility in women include bone anchoring or suture placements by invasive techniques. Hypermobility in women can be relieved by a minimally invasive surgical method that involves passing a suture into the pelvic floor and tightening the suture in order that the pelvic floor buckles or otherwise shortens in length. A suturing device as described above may be used to access the pelvic floor through a small anterior vaginal incision. The end of the distal tip of a suturing device can be pressed against the pelvic floor and a suture can be thrown. The suture can be tightened manually or by a surgical device know in the art. Although this description relates to a specific application, i.e., shortening the pelvic floor via a transvaginal approach, it is to be understood that the principles and construction herein described may be applied to other areas of the human body, and for other procedures requiring suturing body structures.

[0042] FIGS. **9**A-D depict a surgical method for treating hypermobility in women. The surgical method includes positioning the distal tip **900** of a surgical device **905** (partially shown) against the surface of the pelvic floor **910** (**FIG. 9A**) and deploying the device so that the needle carrier **915**, which is carrying a needle tip (not shown) with an attached suture **920**, moves in the direction of the arrow and pierces the pelvic floor **910** (**FIG. 9B**). The path of motion of the needle carrier makes two passages of the tissue of the pelvic floor **910**. The needle carrier **915** carries a needle tip into the needle catch **925** in the distal tip **900**. In **FIG. 9C** the needle carrier **915** is retracted into the distal tip **900**, the needle tip is retained in the needle catch **925** and the distal tip **900** is retracted from the surface of the pelvic floor **910**. The suture **920** remaining in the pelvic floor **910** (**FIG. 9C**) is tightened and tied thus causing the buckling an effective shortening of the pelvic floor **910** (**FIG. 9D**).

[0043] FIGS. **10**A-F depict a surgical method for treating hypermobility in women involving the passing of two sutures into the pelvic floor. The surgical method includes placing the distal tip **1000** of a surgical device **1005** (partially shown) against the surface of the pelvic floor **1010** and deploying the device so that the needle carrier **1015**, which is carrying a needle tip **1020** with an attached suture **1025**, moves in the direction of the arrow and pierces the pelvic floor **1010** (**FIG. 10A**). The needle carrier **1015** carries a needle tip **1025** into the needle catch **1030** in the distal tip **1000**. In **FIG. 10B** the needle carrier **1015** is retracted into the distal tip **1000**, and while the needle tip is retained in the needle catch **1030** the distal tip **1000** is retracted from the surface of the pelvic floor **1010**. The needle tip **1020** is extracted from the needle catch **1030** (**FIG. 10B**) and reloaded into the needle carrier **1015** (**FIG. 10C**). In **FIG. 10D** the suture **1025** is placed in the pelvic floor **1010** in a second location a certain distance from the first suture placement. In **FIG. 10E** the needle carrier **1015** is retracted into the distal tip **1000**, and the needle tip is retained in the needle catch **1030**. The retention of the needle tip **1020** in the needle catch **1030** allows for the retention and control of the leading end of the suture **1025** while the distal tip **1000** is retracted from the surface of the pelvic floor **1010** (**FIG. 10E**). In **FIG. 10F** the suture **1025** remaining in the pelvic floor **1010** is tightened and tied thus causing the buckling and effective shortening of the pelvic floor **1010**. The distance between the two suture placements is directly proportional to the degree to which the pelvic floor **1010** can be shortened. The degree to which the pelvic floor **1010** is shortened can also be controlled by how tightly the suture **1025** is drawn in and tied.

[0044] Having described certain embodiments of the invention, it will be apparent to those of ordinary skill in the art that other embodiments incorporating the concepts disclosed herein can be used without departing from the spirit and the scope of the invention. Accordingly, the described

embodiments are to be considered in all respects only as illustrative and not restrictive.

What is claimed is:

1. A suturing instrument comprising:

an elongate body member;

a needle deployment system disposed at a distal portion of the elongate body member, the needle deployment system comprising a forward-deploying needle carrier; and

a catch disposed on the elongate body member to receive and retain the needle.

2. A suturing instrument as defined in claim 1, further comprising a deployment controller having a distal end, the deployment controller extending substantially along a longitudinal axis of the elongate body member to the distal portion of the elongate body member where the distal end of the deployment controller being coupled to the needle carrier to facilitate movement of the needle carrier between a retracted position and a deployed position.

3. A suturing instrument as defined in claim 2, further comprising an actuator coupled to a proximal end of the deployment controller.

4. A suturing instrument as defined in claim 2, wherein the deployment controller is configured to guide the needle carrier along a path that comprises a proximal curved path segment leading initially away from the elongate body member and then towards the elongate body member.

5. A suturing instrument as defined in claim 1, further comprising a second needle carrier.

6. A suturing instrument as defined in claim 1, further comprising a suture with an attached needle.

7. A suturing instrument as defined in claim 6, wherein the needle inserts into the needle carrier.

8. A suturing instrument as defined in claim 1, wherein the catch is positioned on the elongate body member such that a distal path segment of the needle carrier's path is intercepted by the catch.

9. A suturing instrument as defined in claim 2, further comprising a flexible drive member coupling the deployment controller to the needle carrier

10. A suturing instrument as defined in claim 9, wherein the flexible driver member comprises an alloy including nickel and titanium.

11. A suturing instrument as defined in claim 1, wherein the needle carrier and needle catch are located in a distal tip assembly coupled to the elongate body member such that the distal tip assembly is free to rotate axially about a longitudinal axis with respect to the elongate body member.

12. A suturing instrument as defined in claim 1, wherein the needle carrier and needle catch are located in a distal tip assembly coupled to the elongate body member at a pivot joint such that the distal tip assembly is free to deflect about the pivot joint.

13. A method for placing a suture in tissue comprising the steps of:

placing a suturing instrument enclosing a forward-deploying needle carrier including a needle, wherein the forward-deploying needle carrier is movably positioned within a needle carrier channel adjacent the tissue to be sutured;

deploying the forward-deploying needle carrier out of the suturing instrument through a forward-directed exit port; and

capturing the needle carried by the forward-deploying needle carrier in a catch that receives and retains the needle.

14. The method of claim 13, wherein deploying the forward-deploying needle carrier out of the suturing instrument through a forward-directed exit port comprises activating a deployment controller, the deployment controller having a distal end and extending substantially along a longitudinal axis of an elongate body member to the distal portion of the elongate body member, the distal end of the deployment controller being coupled to the needle carrier to facilitate movement of the needle carrier between a retracted position and a deployed position.

15. The method of claim 14, wherein deploying the forward-deploying needle carrier out of the suturing instrument through a forward-directed exit port comprises activating an actuator coupled to a proximal end of the deployment controller.

16. The method of claim 14, wherein deploying the forward-deploying needle carrier out of the suturing instrument through a forward-directed exit port comprises activating the deployment controller, the deployment controller being configured to guide the needle carrier along a path that includes a proximal curved path segment leading initially away from the elongate body member and then toward the elongate body member.

17. The method of claim 13, further comprising placing a suturing instrument enclosing a second forward-deploying needle carrier including a needle, wherein the second forward-deploying needle carrier is movably positioned within a needle carrier channel adjacent the tissue to be sutured.

18. The method of claim 13, wherein placing a suturing instrument enclosing a forward-deploying needle carrier further comprises associating a suture with said needle.

19. The method of claim 13, wherein the needle carrier follows a path including a distal path segment, the needle being intercepted by the catch as the needle carrier traverses the distal path segment.

20. A method for shortening the pelvic floor comprising the steps of:

placing a suturing instrument enclosing a forward-deploying needle carrier including a needle adjacent to the tissue of the pelvic floor;

deploying the suturing instrument such that the suture is passed through the tissue of the pelvic floor; and

tightening the suture such that the pelvic floor buckles and is effectively shortened in height.

21. The method of claim 20, further comprising a second deploying of the suturing instrument such that the suture is passed through the tissue of the pelvic floor prior to tightening the suture such that the pelvic floor buckles and is effectively shortened in height.

22. The method of claim 20, wherein the suturing instrument comprises:

an elongate body member;

a needle deployment system disposed at a distal portion of the elongate body member, the needle deployment system comprising the forward-deploying needle carrier; and

a catch disposed on the elongate body member to receive and retain the needle.

23. The method of claim 22, wherein the suturing instrument further comprises:

a deployment controller having a distal end, the deployment controller extending substantially along a longitudinal axis of the elongate body member to the distal portion of the elongate body member, the distal end of the deployment controller being coupled to the needle carrier to facilitate movement of the needle carrier between a retracted position and a deployed position.

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